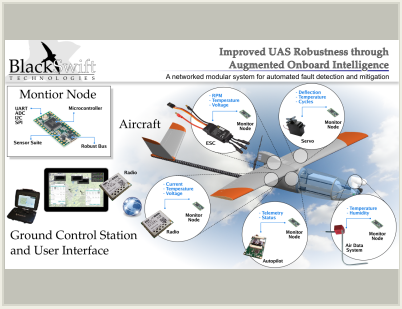
Small Business Innovation Research/Small Business Tech Transfer

Improved UAS Robustness through Augmented Onboard Intelligence, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

This work will focus on the development of a highly capable avionics subsystem and machine learning algorithms to provide early warning of potential failures of critical subsystems on small UAS. This modular system will consist of networked onboard monitoring nodes capable of observing operations and providing notification of off-nominal conditions to the autopilot as well as the operator, mitigating the risk of failure, and providing critical information regarding required maintenance. The boards, while computationally powerful will be limited in size, weight and power to avoid significantly impacting the performance of current vehicles and simplify its installation. Furthermore, the networked devices will be able to communicate with each other as well as the autopilot, allowing for vehicle wide information to contribute to a high degree of awareness of the vehicle's well-being. The primary objectives are: 1.Determination of a set of subsystems commonly employed by UAS whose failure would cause a system critical issue. 2.The identification of a set of sensors and machine learning algorithms capable of providing the necessary inputs to detect the health and status of its associated subsystem, and determining the probability of a fault occurring in the near future. 3.The design of a monitoring node capable of interfacing to the required set of sensors and implementing the machine learning algorithms. The nodes will also be limited to a size and weight that will allow for them to be installed on most UAS without impacting the vehicle's performance. 4.The design of an onboard network capable of supporting communications between all smart monitoring nodes on the aircraft. Each node can then communicate any potential failures to the autopilot and/or operator as well as share information that will allow for the implementation of distributed machine learning algorithms between the nodes and recognition of cross-correlation between systems.



Improved UAS Robustness through Augmented Onboard Intelligence, Phase I Briefing Chart Image

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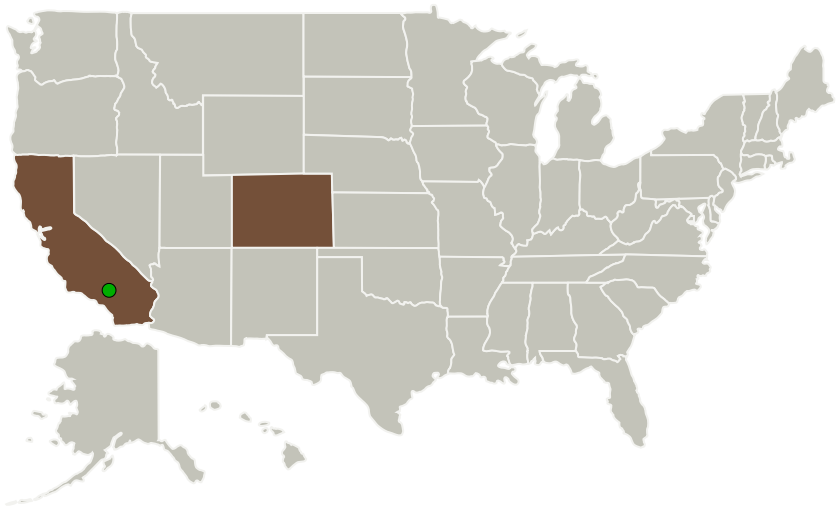
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Black Swift Technologies, LLC	Lead Organization	Industry	Boulder, Colorado
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Colorado

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Black Swift Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

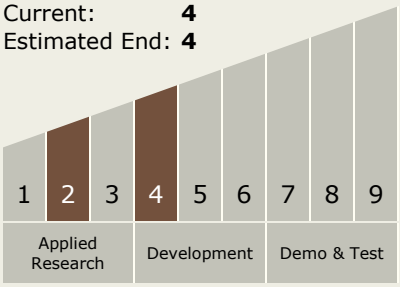
Carlos Torrez

Principal Investigator:

Jack S Elston

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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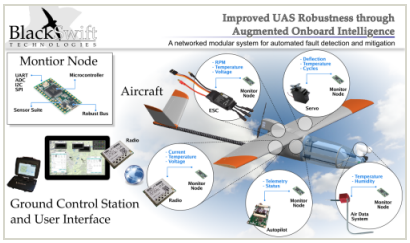
Images



Briefing Chart Image
Improved UAS Robustness through Augmented Onboard Intelligence, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/133453)*

Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.4 Execution and Control